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(71) Applicant
Ricoh Company Ltd

(Incorporated in Japan)

3–6 1-chome Nakamagome, Ota-ku, Tokyo, Japan

(72) Inventors
Susumu Okuyama
Tomio Wakabayashi

(74) Agent and/or Address for Service
Mathisen Macara & Co,
The Coach House, 6–8 Swakeleys Road, Ickenham,
Uxbridge UB10 8BZ

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B8R
Selected US specifications from IPC sub-class B65H

(54) Automatic sheet feeder for a printer

(57) Sheets 11 are fed one by one from a cassette 12 detachably mounted in a printer 2, the printer having a platen 3 for separating and feeding sheets, and the cassette having a friction member 15 pressing against the platen. As shown, the platen 3 forms the anvil for printer hammer 7, cooperating with type wheel 6 and ink ribbon 8.

FIG.2

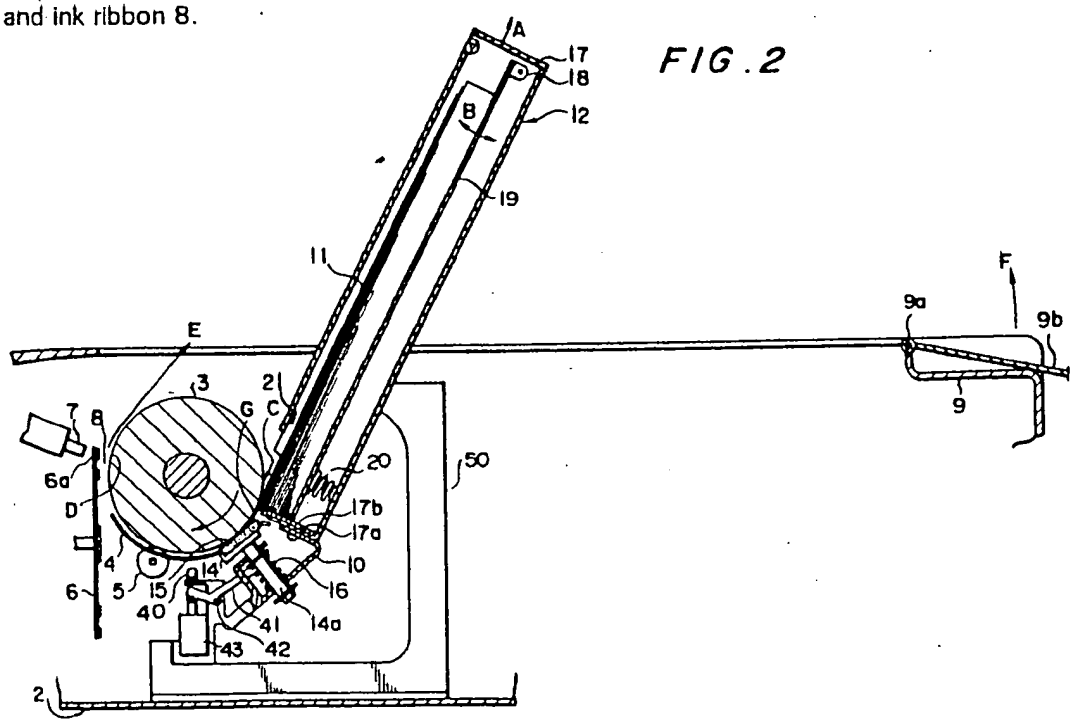

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FIG. 1

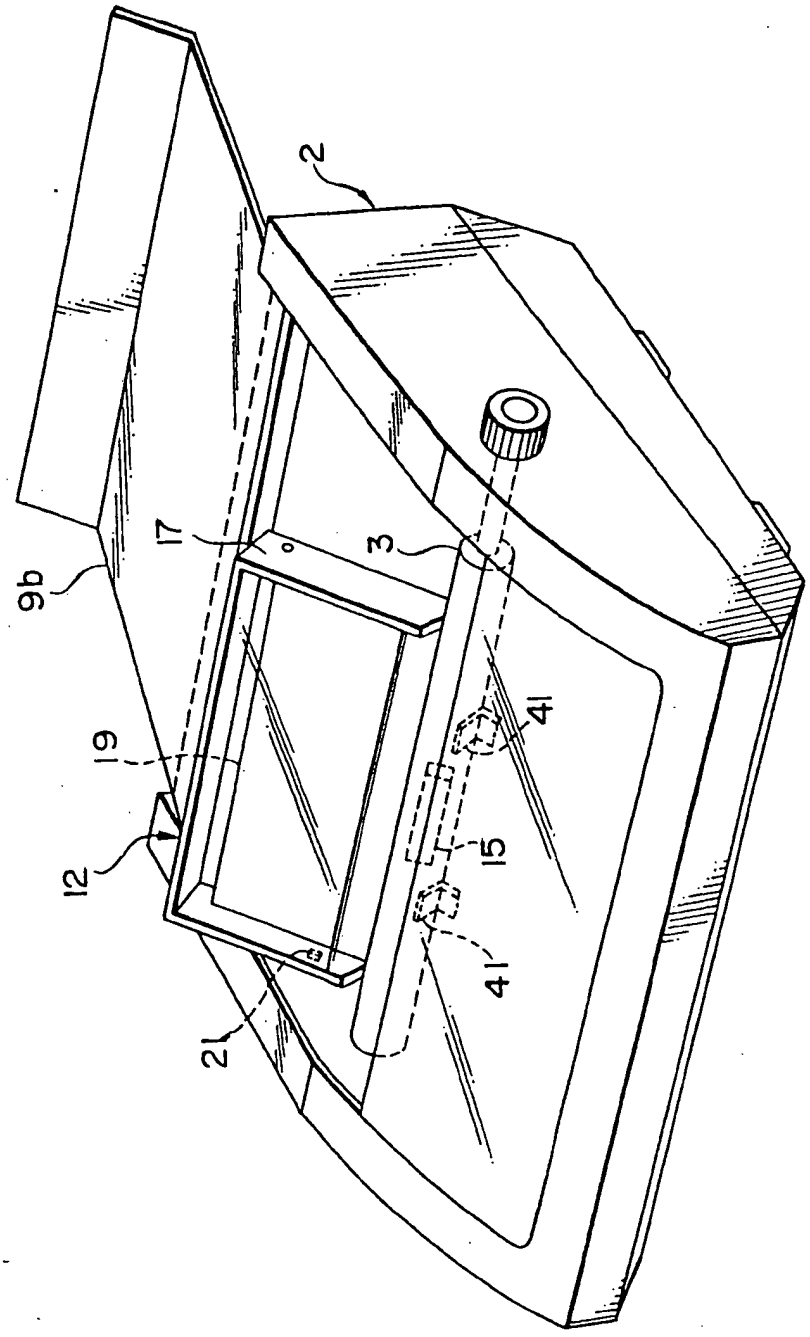

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FIG.2

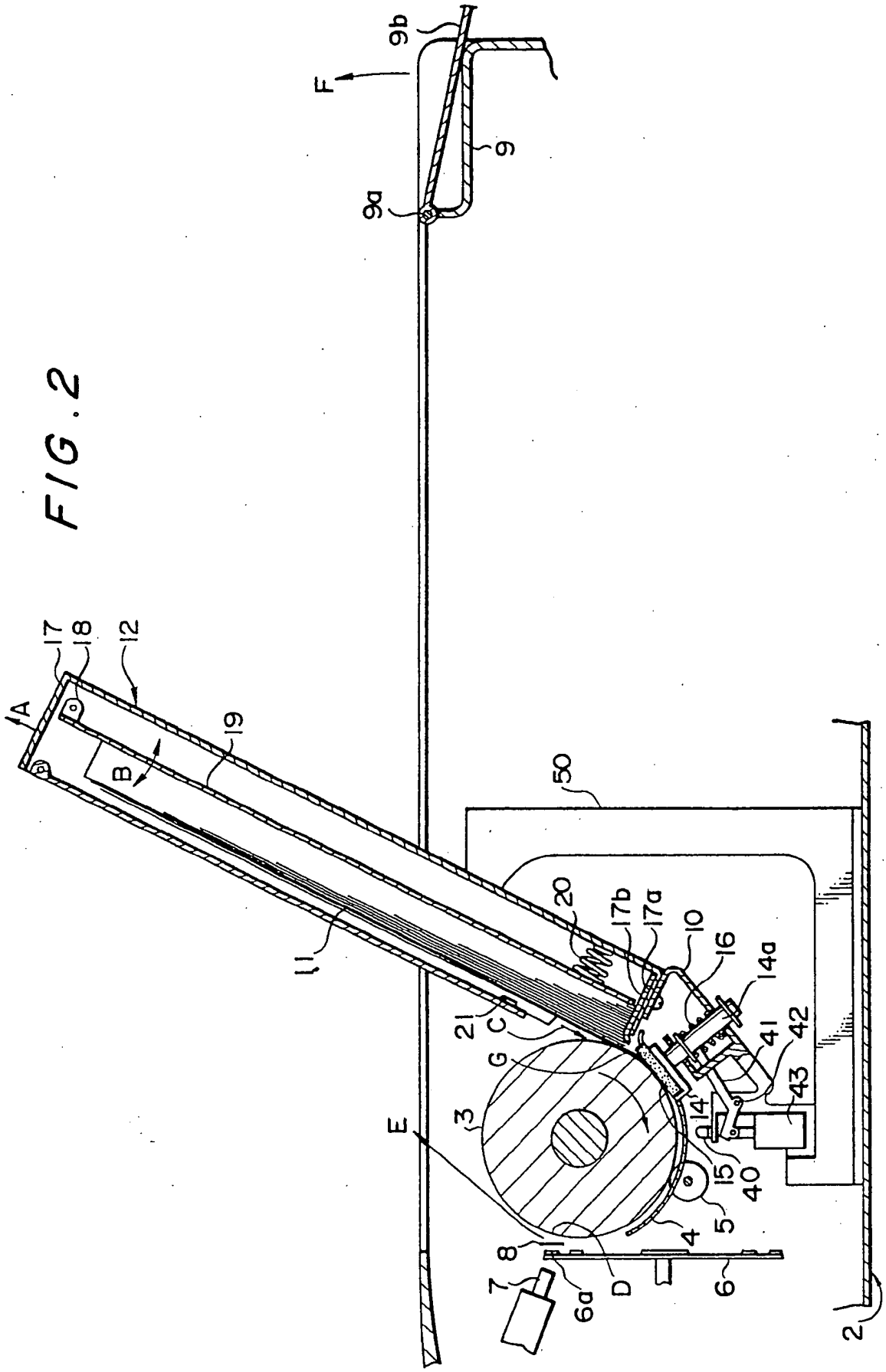

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FIG. 3

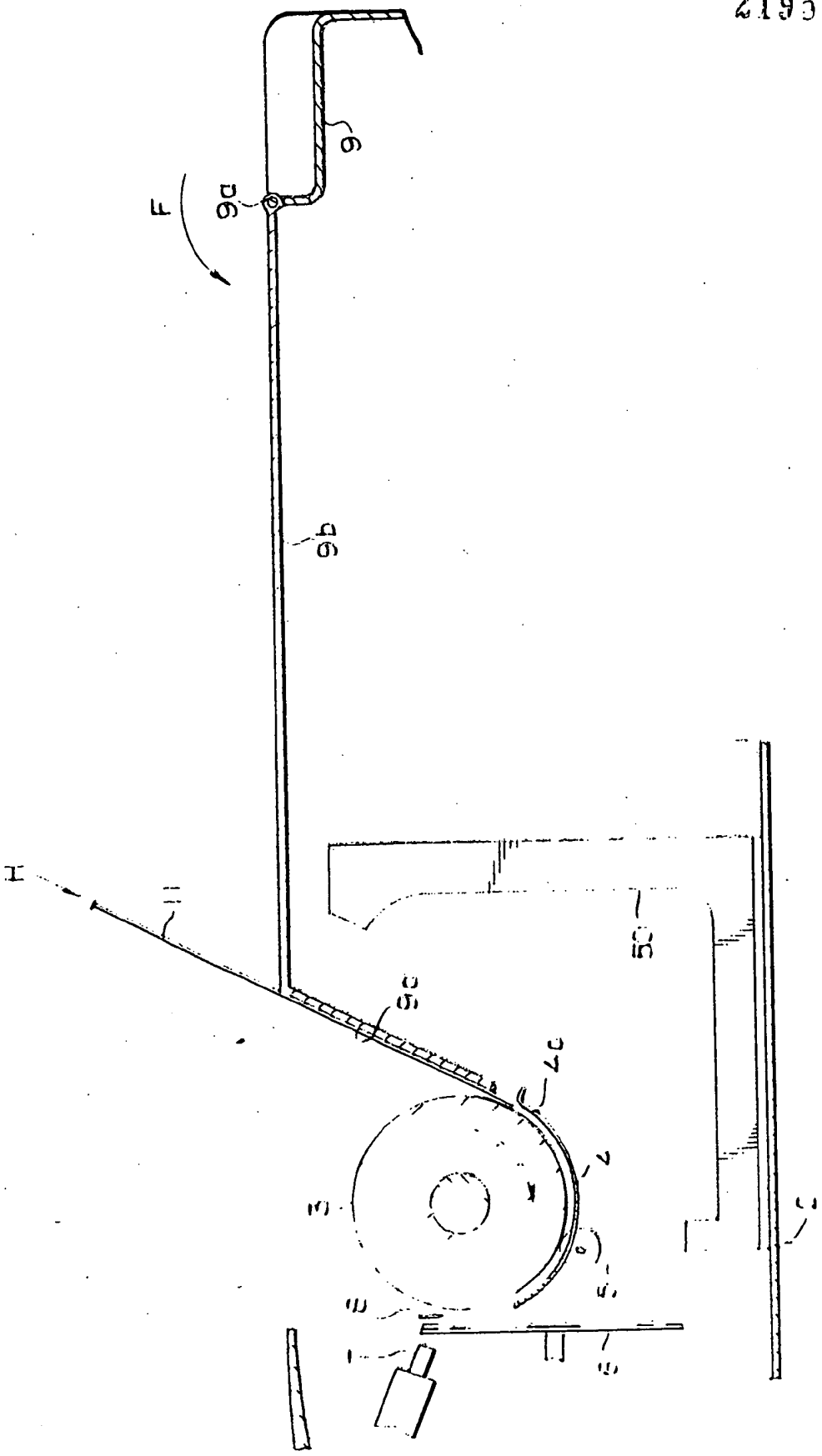

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FIG. 4

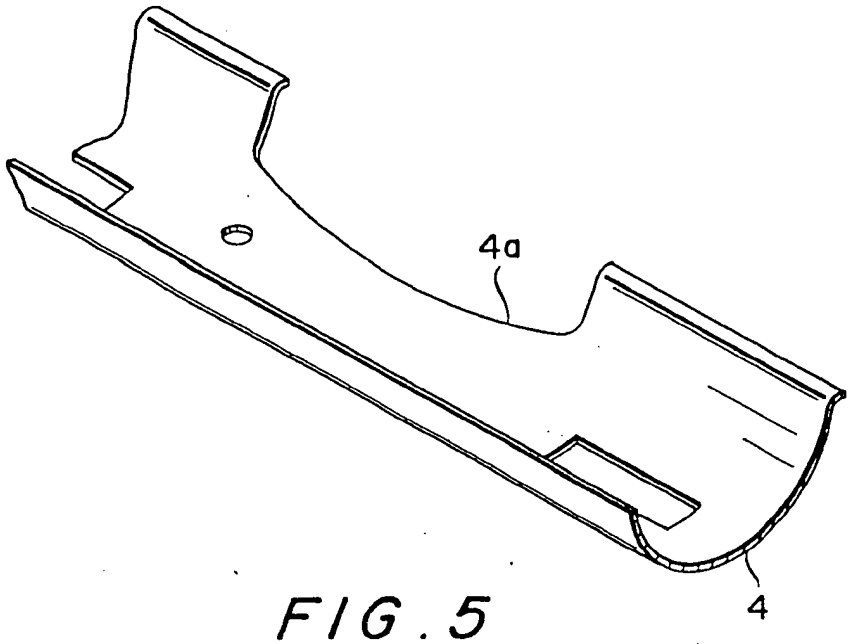

FIG. 5

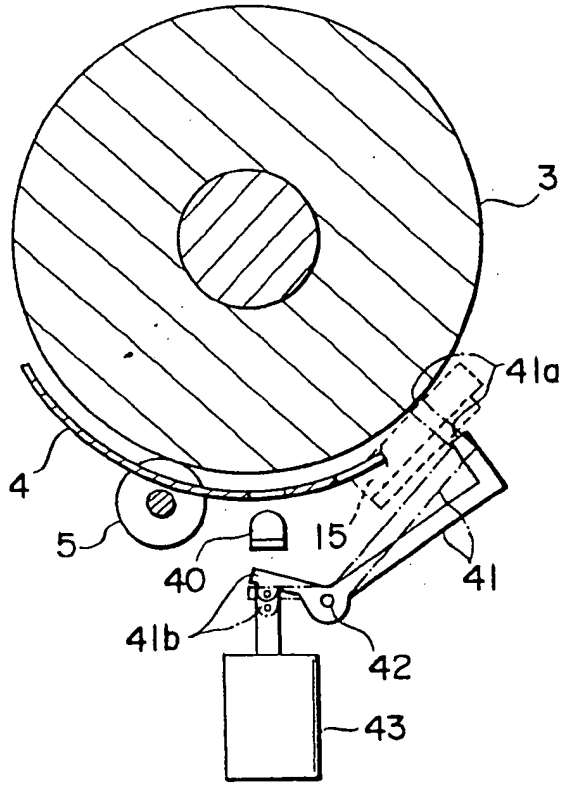

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FIG. 6

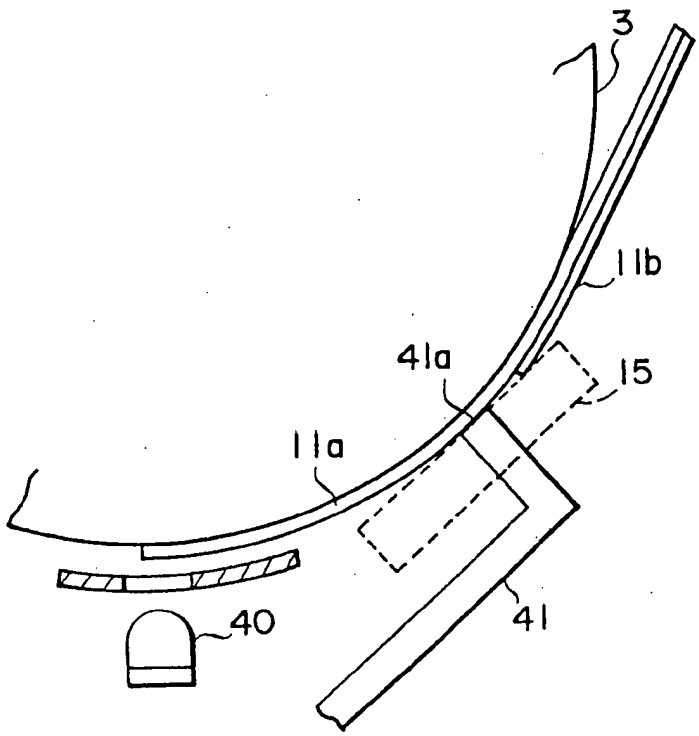

FIG. 7

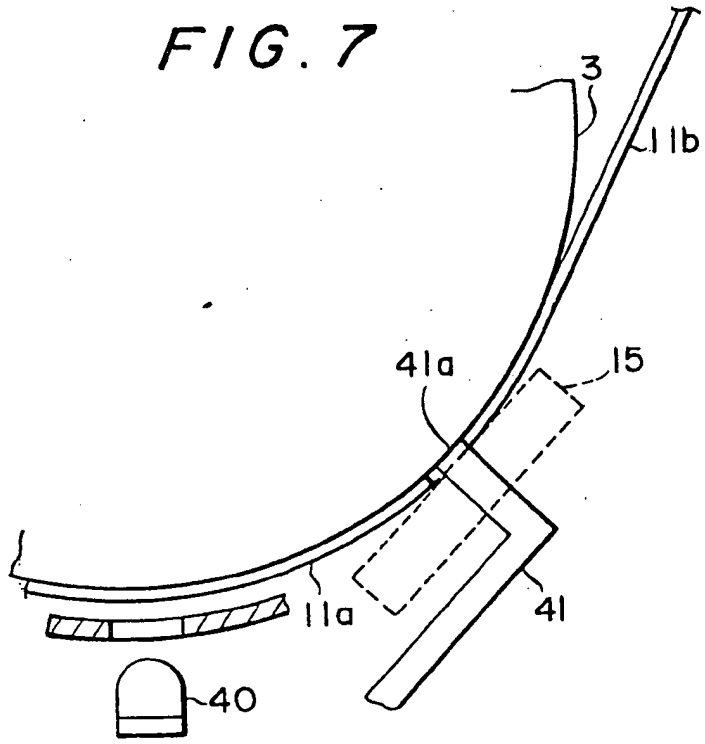

FIG. 8

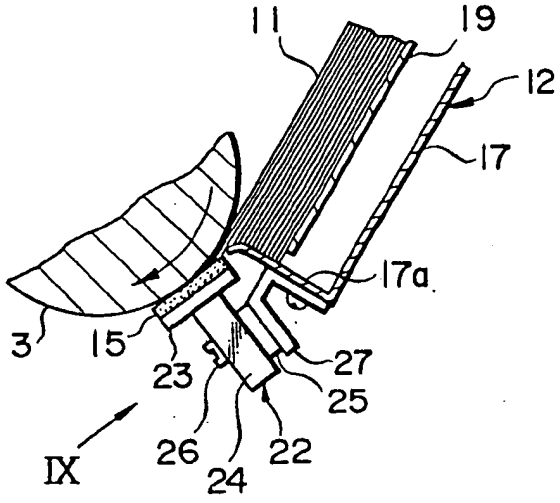

FIG. 9

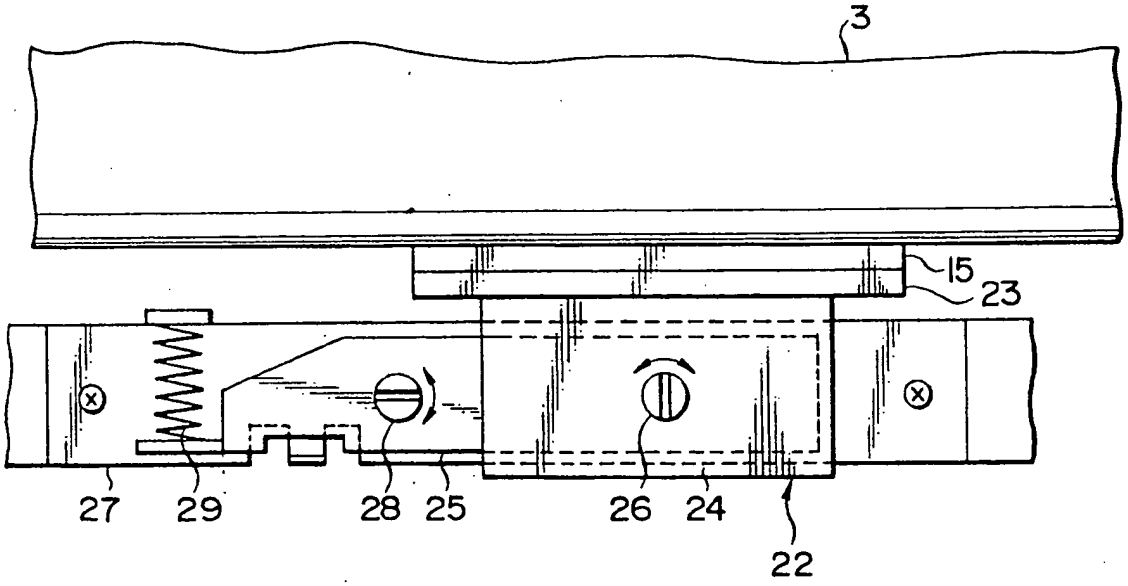

FIG. 10

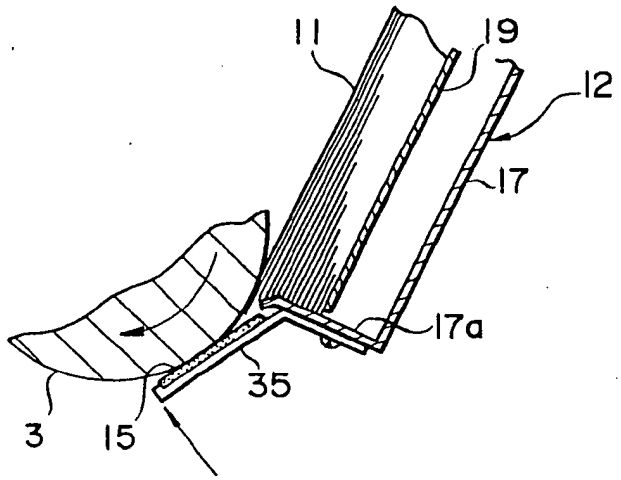

FIG. 11

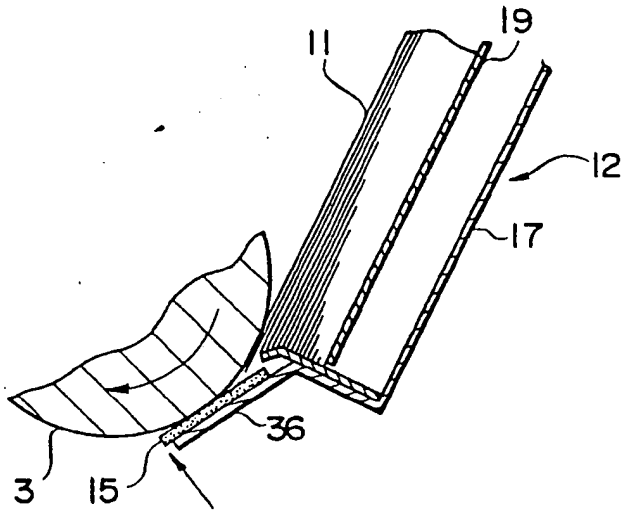

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FIG. 12

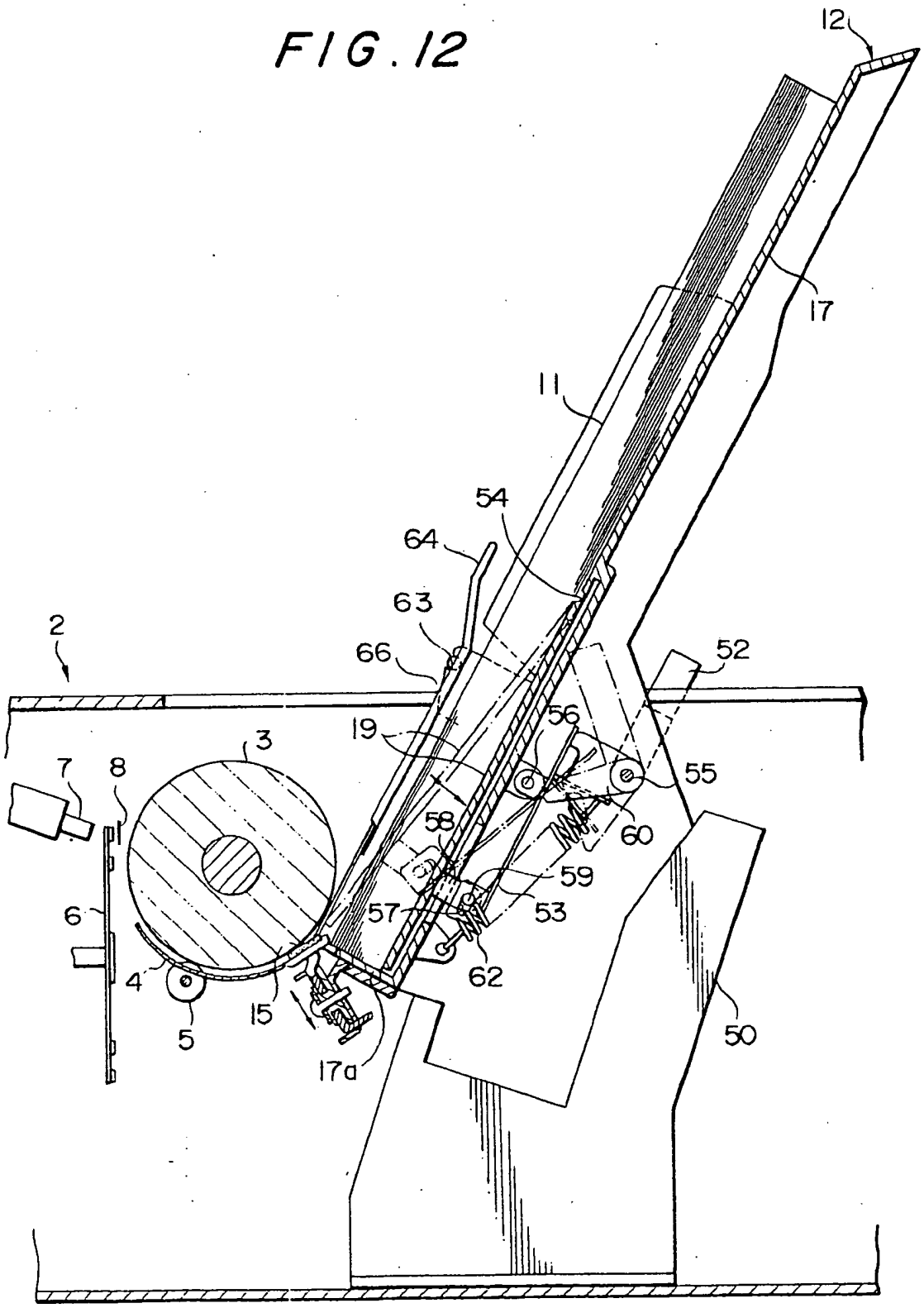

FIG. 13

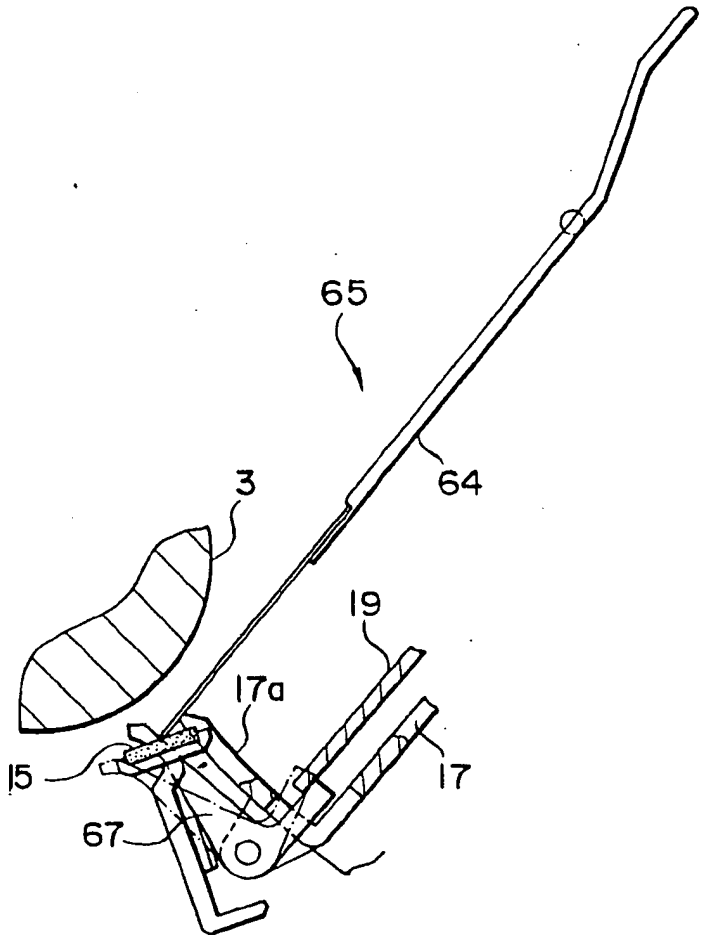

FIG. 14

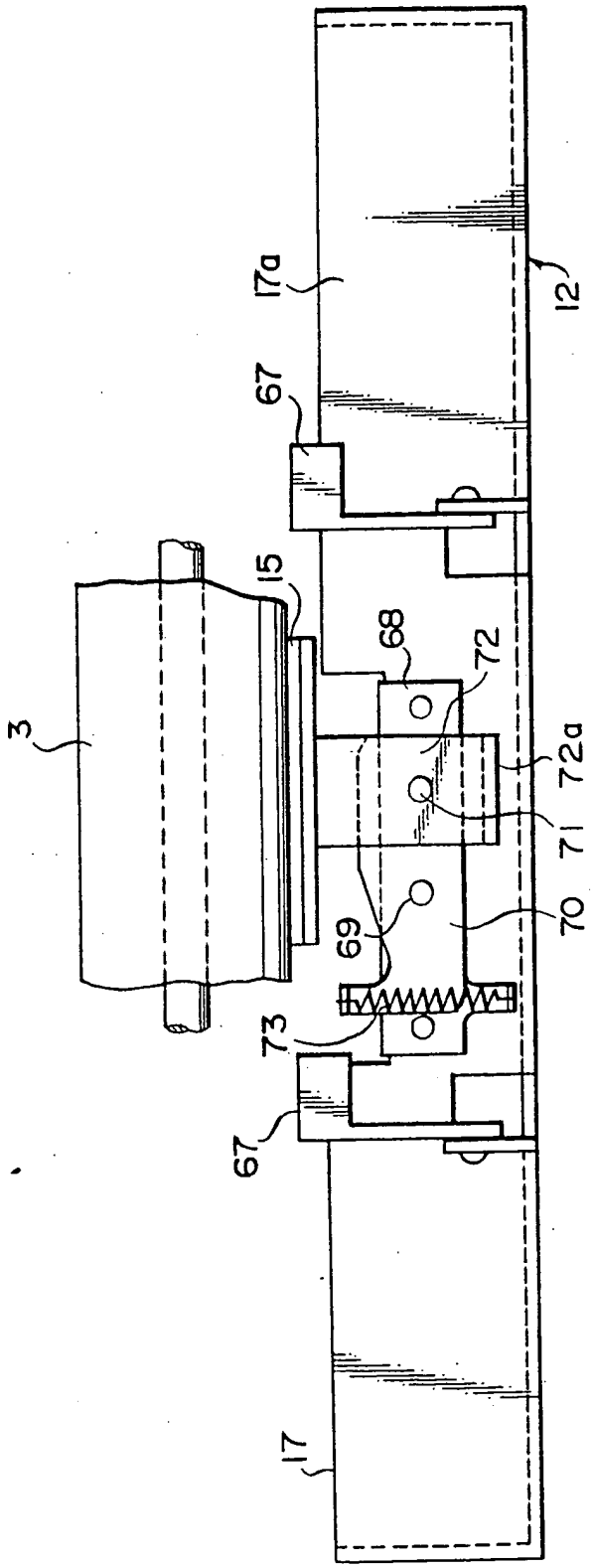

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FIG. 15

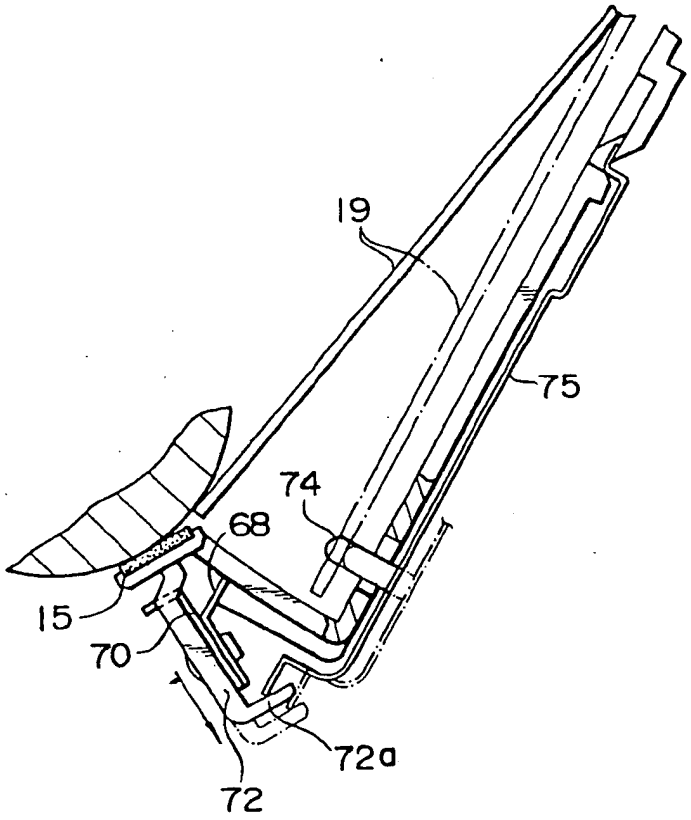

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FIG. 16

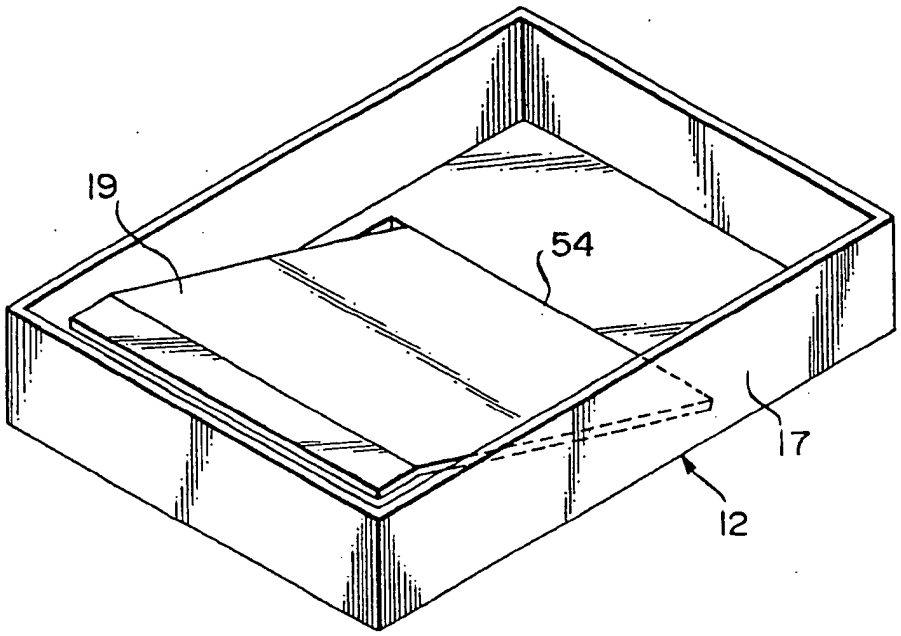
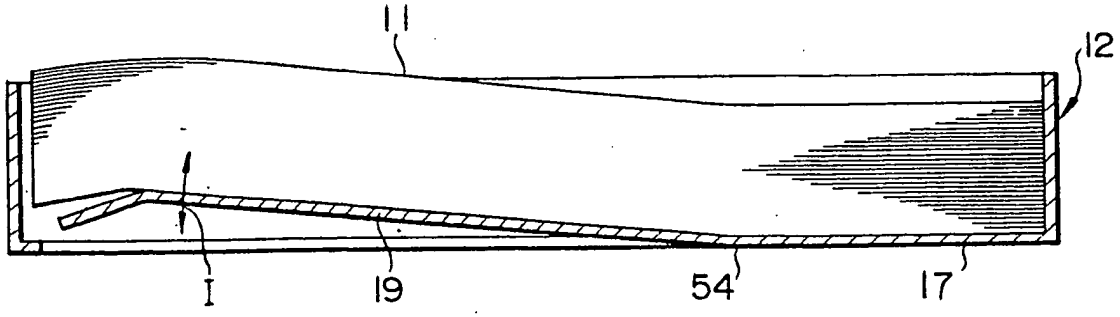


FIG. 17



SPECIFICATION

Automatic sheet feeder for a printer

The present invention relates to an automatic sheet feeder for a printer which feeds sheets one by one to a printing station of the printer.

Various types of automatic sheet feeders have heretofore been proposed and put to practical use. One of the prior art types of automatic sheet feeders includes a sheet separating and transporting means which is implemented with a friction member and a feed roller. A problem with this type of automatic sheet feeder is that the feed roller which has to be installed independently of the friction member complicates the structure of the entire sheet feeder and invites an increase in cost.

It is, therefore, an object of the present invention to provide an automatic sheet feeder for a printer which is simple in structure and low cost.

It is another object of the present invention to provide an automatic sheet feeder for a printer which may be used with a printer body by those who need automatic sheet feed only.

It is another object of the present invention to provide an automatic sheet feeder for a printer which promotes the ease of maintenance.

It is another object of the present invention to provide a generally improved automatic sheet feeder for a printer.

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings.

In accordance with the present invention, in an automatic sheet feeder for a printer which includes a platen for separating and feeding sheets one by one from a sheet cassette which is detachably mounted on a printer body, the sheet cassette is provided with a friction member which makes pressing contact with the platen. The sheet moves through between the friction member and the platen when the sheet cassette is mounted on the printer body.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an external perspective view of a printer with which an automatic sheet feeder embodying the present invention is used, a sheet cassette being shown in an empty condition;

Figure 2 is a vertical section of the printer as shown in Fig. 1, the sheet cassette being loaded with sheets;

Figure 3 is a section similar to Fig. 2, showing a condition in which the sheet cassette is removed to effect manual sheet feed;

Figure 4 is a perspective view of a deflector;

Figure 5 is a partly sectional fragmentary side elevation showing the construction of a stop with a friction member represented by a dashed line;

Figure 6 is a view showing the stop being abutted against a platen through the first sheet;

Figure 7 is a view similar to Fig. 6, showing the stop which is directly abutted against the platen to obstruct the movement of the second sheet;

Figure 8 is a fragmentary section showing another specific construction of a pressing means;

Figure 9 is a view as seen in a direction indicated by an arrow IX in Fig. 8;

Figures 10 and 11 are views showing other specific constructions of the pressing means;

Figure 12 is a section showing a printer in which an automatic sheet feeder in accordance with another embodiment of the present invention is installed;

Figure 13 is a fragmentary view showing in detail the front end of a sheet cassette and its neighborhood in accordance with the embodiment of Fig. 12;

Figure 14 is a view as seen from the left of Fig. 13;

Figure 15 is a view showing a mechanism for cancelling a separating pressure which is exerted by a friction member;

Figure 16 is a perspective view of a case in accordance with still another embodiment of the present invention; and

Figure 17 is a section showing the case of Fig. 16 which is loaded with sheets.

Referring to Figs. 1 and 2 of the drawings, there is shown a sheet cassette 12 of an automatic sheet feeder embodying the present invention which is mounted in a body 2 of a printer. As shown, the printer body 2 houses a platen 3 which is rotatably supported by a frame, not shown, through bearings, not shown, as well known in the art. The platen 3 is driven in a rotational motion by a drive source, not shown, through gears, a belt or like drive transmitting means. A deflector 4 extends along the periphery of the platen 3 to guide a sheet. A transport roller 5 is pressed against the platen 3 by a predetermined force. Also housed in the printer body 2 are a type wheel 6, a hammer 7, and an ink ribbon 8 which per ce are well known in the art. The reference numeral 9 designates a top cover of the printer. A cover 9b is hinged to the top cover 9 through a pin 9a to be angularly movable between an open position as shown in Figs. 1 and 2 and a closed position as shown in Fig. 3 about the pin 9a. When the sheet cassette 12 is loaded in the printer body 2, as shown in Fig. 2, the movable cover 9b is held in the open position.

The sheet cassette 12 which forms a part of the automatic sheet feeder is supported by any suitable support means such as a pedestal

50 which is mounted on the bottom of the printer body 2. The sheet cassette 12 is positioned such that its lower portion faces the platen 3. In this particular embodiment, a support member which is rigidly connected to the sheet cassette 12 as described later is also supported by the pedestal 50. The sheet cassette 12 may be pulled out of the printer body 2 in a direction indicated by an arrow A in Fig. 2 and inserted into the printer body 2 in the opposite direction to the direction A until it rests on the pedestal 50. In this manner, the sheet cassette 12 is detachably mounted in the printer body 2.

The automatic sheet feeder includes a friction member 15 in addition to the sheet cassette 12. The friction member 15 is supported by the sheet cassette 12, specifically the support member 10, and not by the printer body. Specifically, in this particular embodiment, the support member 10 is rigidly connected to a lower or front wall 17a of a case of the sheet cassette 12 which is adapted to accommodate sheets, and a holder member 14 is supported by the support member 10 in such a manner as to be movable at least in the radial direction of the platen 3. The friction member 15 is rigidly held by the holder member 14. A coiled compression spring 16 is wound round a base portion 14a of the holder member 14 to serve as an urging means, whereby the friction member 15 is held in pressing contact with the periphery of the platen 3. The friction member 15 is implemented with a padding which per ce is well known in the art.

The sheet cassette 12 shown in Fig. 2 is constituted by the above-mentioned case 17, a loading plate 19 disposed in the case 17 and rotatable as indicated by an arrow B about a pin 18, a compression spring 20 for constantly urging the loading plate 19 clockwise about the pin 18, and a stop member 21 provided on the case 17 for limiting such angular movement of the loading plate 19. Sheets 11 are stacked on the loading plate 19, and the sheet 11 on the top of the stack is pressed against the platen 3 at its leading end portion, or lower portion as seen in Fig. 2, by the action of the spring 20. While the lower end of the sheet stack 11 rests on a sustaining plate 17b which is fixed to the front wall 17a of the case 17, a predetermined small gate gap G is defined between the tip of the sustaining plate 17b and the platen 3. If desired, the lower end of the sheet stack 11 may be directly sustained by the front wall 17a of the case 17 (see a specific construction shown in Fig. 8). Also, the compression spring 20 adapted to press the top sheet 11 against the platen 3 may be replaced with any other suitable resilient member.

When the platen 3 is rotated clockwise as indicated by an arrow in Fig. 2, the leading against the platen 3 is fed as indicated by an arrow C by a frictional force which is exerted by the platen 3, until it has been nipped between the friction member 15 and the platen 3. In this instance, assuming that the frictional force acting between the platen 3 and sheet 11 is μ_1, that acting between the friction member 15 and sheet 11 is μ_2, and that acting between the sheets 11 is μ_3, the respective frictional forces are so selected as to satisfy a relationship $\mu_1 > \mu_2 > \mu_3$. Under this condition, when a single paper 11 is fed to between the platen 3 and the friction member 15, the platen 3 exerts a greater friction force on the sheet 11 than the friction member 15 and, therefore, drives the sheet 11 while causing the latter to slip on the friction member 15. When two or more sheets 11 are accidentally fed together through the gate gap G to between the friction member 15 and the platen 3, only the top sheet which makes contact with the platen 3 is separated from the others and, then, transported wrapping around the platen 3. In this manner, the platen 3 itself constitutes a part of the automatic sheet feeder while playing the role of the traditional feed roller, so that the sheets 11 are separated and fed one by one in exactly the same manner as in the prior art feed roller and friction member type sheet separating mechanism. The platen 3 may be made of natural rubber (NR), styrene-butadiene rubber (BSR), nitryl rubber (NBR), chloroprene rubber (CH), urethane rubber, or like material. On the other hand, the friction member 15 may be made of formed polyurethane or the like.

The single paper 11 driven out of the sheet cassette 12 is transported while being guided by the deflector 4 and transport roller 5 as in an ordinary printer. The hammer 7 impacts against that part of the sheet 11 which has reached a printing station D where it faces the hammer 7, through a type 6a of the type wheel 6 and ribbon 8. The sheet 11 moved past the printing station D and printed with desired data is fed out of the printer as indicated by an arrow E.

As described above, the friction member 15 and platen 3 implement the separation and transport of a sheet in the automatic sheet feeder, and the platen 3 further serves as a sheet pick-up roller. This eliminates the need for an independent feed roller heretofore installed in an automatic sheet feeder, thereby simplifying the structure. Nevertheless, the separation of a sheet itself is performed as efficiently as in a prior art automatic sheet feeder. Because the sheet cassette 12 is detachably mounted on the printer body 2, only those users who desire automatic sheet feed may purchase the sheet cassette 12 and use it with a printer, i.e., those who do not need automatic sheet feed may manually feed sheets without the intermediary of the sheet

member 15 is provided integrally with the sheet cassette 12, when the sheet cassette 12 is pulled out of the printer body 2, the friction member 15, too, is removed from the printer body 2. Therefore, the friction member 15 can be easily removed from the printer body 2 for maintenance and others. In addition, the friction member 15 is not mounted on the printer body 2 and cuts-down the cost of the printer body 2 correspondingly, whereby the users who do not need the sheet cassette 12 are freed from needless defrayal. If desired, the sheet cassette 1 may be removed from the printer body 2 and replaced with a traditional mount type automatic sheet feeder, or a form tractor adapted to feed a continuous form.

If the sheet cassette 12 is pulled out of the printer body 2 from the position shown in Fig. 2, sheets may be manually fed one by one, as previously stated. In this particular embodiment, the movable cover 9b is usable for promoting surer and simpler manual insertion. Specifically, as shown in Fig. 3, after the sheet cassette 12 has been removed from the printer body 2, the movable cover 9b is rotated about the pin 9a from the open position of Fig. 2 to the closed position of Fig. 3 as indicated by an arrow F. In the closed position, a slot for manual sheet insertion is defined between the platen 3 and an inclined end portion 9c of the movable cover 9b. As a person inserts a sheet into the printer body 2 through the abovementioned slot as indicated by an arrow H, the sheet is guided by the end portion 9c of the movable cover 9b and the deflector 4 to between the deflector 4 and the platen 3. As shown in Fig. 4, the deflector 4 is provided with a notch 4a so that, when the sheet cassette 12 is loaded in the printer body 2, the friction member 15 and a stop 41, which will be described, do not interfere with the deflector 4. When the sheet cassette 12 is to be mounted in the printer body 2, the movable cover 9b is rotated to the open position of Fig. 2 to prevent it from interfering with the sheet cassette 12.

When a sheet in transport jamms the printer while the sheet cassette 12 is in use, it can be removed with ease by dismounting the sheet cassette 12 and, if necessary, the platen 3. The transport roller 5 may be supported in such a manner as to be movable toward and away from the platen 3 in order to promote easier removal of a jamming sheet and for the convenience of installation of a form tractor.

The construction described so far allows the sheets 11 to be fed one by one timed to the rotation of the platen 3. However, when a plurality of sheets 11 are sequentially fed by the rotation of the platen 3, such a construction alone cannot provide a substantial interval between the sheets which are fed one after another. While such sheet feed without substantial interval is acceptable in practice, it is sometimes desired to provide an interval between the sheets. In the light of this, the automatic sheet feeder of Fig. 2 includes the stop 41 as will be described hereinafter.

As shown in Figs. 2 and 5, a photosensor 40 is located in a position downstream of the friction member 15 with respect to the intended direction of sheet transport. The photosensor 40 which may be constituted by a light source and a light-sensitive element serves as a sheet sensing means. The stop 41 is movable into and out of contact with that part of the periphery of the platen 3 which is positioned downstream of a region where the sheet 11 is to be separated from the stack. As shown, the stop 41 is rotatably supported by a pin 42 and enagageable with the platen 3 at one end 41a thereof. The other end 41b of the stop 41 is operatively connected to a plunger of a solenoid 43. In this configuration, when the solenoid 43 is energized, it causes the end 41b of the stop 41 into abutment against the platen 3 as indicated by a dash-and-dot line in Fig. 5. Conversely, when the solenoid 43 is deenergized, it allows the end 41b to move away from the platen 3 due to the gravity of the stop 41 or under the action of a spring, not shown, as indicated by a solid line in Fig. 5. The stop 41 is situated in a position where it would not interfere with the friction member 15. While any desired number of such stops 41 may be provided, two stops 41 are used in the printer of Fig. 1. The solenoid 43 is merely an illustrative means for driving the stop 41 and may be replaced with any other suitable implementation.

When the first sheet 11 begins to be fed from the sheet cassette 12, the solenoid 43 is held in a deenergized condition so that the end 41a of the stop 41 remains clear of the platen 3. As soon as the leading end of the sheet 11 moves past the photosensor 40, the photosensor 40 produces a signal which is representative of the presence of a sheet, thereby energizing the solenoid 43. Then, the end 41b of the stop 41 is pulled toward the solenoid 43 resulting that the stop 41 is rotated counterclockwise as seen in Fig. 5 until its end 41a abuts against the platen 3 through the first sheet 11, as shown in Fig. 6. Nevertheless, the end 41a of the stop 41 does not obstruct the transport of the sheet 11 and, instead, remains in sliding contact with the sheet 11. It is to be noted that in Fig. 6 the first sheet is labeled 11a to be distinguished from the second sheet 11b which is to be fed next. This is true with Fig. 7 as well.

As the first sheet 11a is further driven by the clockwise rotation of the platen 3 until the trailing end of the sheet 11a moves past the end 41a of the stop 41, the end 41a makes direct contact with the platen 3, as shown in Fig. 7. In this condition, the leading end of the

second sheet 11b abuts against the stop 41 to be obstructed thereby. When the first sheet 11a is transported a predetermined distance, the solenoid 43 is deenergized to return the stop 41 to the position indicated by the solid line in Figs. 2 and 5. Consequently, the end 41a of the stop 41 is moved clear of the platen 3 to unblock the second sheet 11b, i.e., the second sheet 11b beings to be fed. Because the first sheet 11a has already been transported to a position remote from the second sheet 11b at the time of start of feed of the second sheet 11b, a predetermined interval is provided between the two sheets 11a and 11b. The procedure described above may be repeated to space the third sheet from the second sheet 11b. The timing for deenergizing the solenoid 43 may be suitably controlled to establish any desired distance between the consecutive sheets 11. Needless to mention, the stop 41 may be constantly spaced from the platen 3 to feed the sheets 11 continuously without any substantial interval.

While the stop 41 is shown and described as comprising a lever-like member, it may be replaced with any other suitable pressing member such as a member which exerts a greater frictional force on a sheet than the platen 3. In such a case, the pressing member may be directly abutted against the platen 3 to block a sheet or pressed against the platen 3 from above a sheet which is to be blocked. The position of the stop 41 shown and described is only illustrative; the gist is that the stop 41 is capable of obstructing the advance of a predetermined sheet. For example, a stop may be disposed in a sheet stacking region of the sheet cassette 12 so as to press the sheet portion within the sheet cassette 12. Further, the photosensor 40 may be replaced with any other suitable sheet sensing means.

While the photosensor 40, stop 41 and solenoid 43 may be supported by any one of the printer body 2 and the sheet cassette 12, it is shown to be supported by the sheet cassette 12 in the embodiment of Fig. 2. Specifically, the solenoid 43, sensor 40 and pin 42 and, therefore, the stop 41 is supported by the previously mentioned support member 10. Mounting those structural elements 40, 41 and 43 on the sheet cassette 12 and not on the printer body 2 contributes to the cutdown of cost of the printer body 2 and, therefore, offers an inexpensive printer body to those users who do not need the sheet cassette 12 and, therefore, do not purchase it. Furthermore, the stop 41, sensor 40, solenoid 43 and others can be easily inspected by removing the sheet cassette 12 from the printer body 2.

Referring to Figs. 8 and 9, another example of the means for pressing the friction member 15 against the platen 3 is shown. As shown, the platen 3 is fixed to a retaining portion 23 of a holder 22. A base end portion 24 of the holder 22 is supported by a lever 25 through a pin 26 to be rotatable about the axis of the pin 26. The lever 25 is supported by a stationary plate 27, which is rigidly connected to the case 17, through a pin 28 in such a manner as to be rotatable as indicated by an arrow in Fig. 9. A compression spring 29 is loaded between lugs which extend from the lever 25 and stationary plate 27, constantly urging the friction member 15 against the platen 3 through the lever 25 and holder 22. Because the holder 22 which supports the friction member 15 is capable of rotating relative to the lever 25 as well, the friction member 15 is allowed to make contact with the platen 3 by an even pressure throughout its length. The feed pressure acting on the sheet 11 may be cancelled by pulling the friction member 15 away from the platen 3 against the force of the spring 29 (in Fig. 2, spring 16).

Alternatively, as shown in Fig. 10, the friction member 15 may be fixed to an elastic member 35 such as a leaf spring which is in turn fixed to the case 17 of the sheet cassette 12. In this alternative configuration, the friction member 15 is pressed against the platen 3 by the elastic force of the member 35 which is directed as indicated by an arrow in the figure, whereby the top sheet 11 is separate from the others as in the previous embodiment.

Further, as shown in Fig. 11, the case 17 may be provided with an extension 36 to which the friction member 15 is bonded. In such a structure, the friction member 15 is urged against the platen 3 by the elasticity of the extension 36 itself, which acts in a direction indicated by an arrow in the figure. The embodiments shown in Figs. 10 and 11 simplify the structure and, therefore, promote cost reduction, compared to the embodiment of Fig. 2.

Referring to Figs. 12 to 15, another embodiment of the present invention is shown which allows sheets to be manually fed with the sheet cassette 12 mounted on the printer body 2.

As shown in Fig. 12, the sheet cassette 12 is detachably mounted on the printer body 2 as in the embodiment of Fig. 2. In this particular embodiment, the loading plate 19 is positioned in a bottom potion of the case 17 to extend over substantially the front half of the sheet cassette 12. The loading plate 19 is angularly movable between a position indicated by a solid line and a position indicated by a dash-and-dots line about its hinged rear end 54. A presser lever 52 is provided for manually operating the loading plate 19 and is positioned outside of the printer body 2 for easy access. The presser lever 52 is rigidly

the printer body 2.

An intermediate lever 53 is located below the bottom of the case 17. Specifically, one end portion of the intermediate lever 53 is rotatably mounted on a shaft 56 which is provided on the underside of the case 17. An elongate slot 57 is formed through the other end of the lever 53, and a pin 59 studded on the free end of an arm 60 which extends out from the underside of the loading plate 19 is received in the slot 57. An arm 60 is rigidly mounted on the shaft 55 which is rotatable integrally with the presser lever 52. The free end of the arm 60 is engageable with that part of the underside of the intermediate lever 53 which neighbors the shaft 56. A spring 62 is anchored at one end to an arm, which extends from a part of the underside of the intermediate lever 53 which is close to the fulcrum, and at the other end to a part of the case 17 which is close to the front end of the case 17. In this construction, while the presser lever 52 is held in a position indicated by a solid line in Fig. 12, the arm 60 presses the intermediate lever 53 to maintain the loading plate 19 in its lowered position as represented by the solid line. As the presser lever 52 is rotated to a position indicated by a dash-and-dots line in the Fig. 12, the pressure force exerted by the arm 60 on the intermediate lever 53 is cancelled resulting that the lever 53 and loading plate 19 are urged by the spring 62 to their raised positions as indicated by a dash-and-dots line each. Then, if the sheets 11 are present on the plate 19 and the bottom of the case 17 which is contiguous with the plate 19, a leading end portion of the top sheet 11 is pressed against the platen 3 so that a pressure is applied to between the sheet 11 and the platen 3. As in the previous embodiment, the friction member 15 which is supported by the sheet cassette 12 is disposed downstream of such a sheet and platen contact position to be movable into and out of pressing contact with the platen 3.

Each of opposite side walls of the case 17 is provided with a bearing recess 63 at its upper edge. A guide plate 64 adapted for manual feed is swingably supported by the case 17 with pins, which are studded on opposite sides of the guide plate 64, individually received in the bearing recsses 63. The center of gravity of the guide plate 64 is located in forwardly of the fulcrum 63 of the guide plate 64. The front end of the guide plate 64 is situated slightly forwardly of the front wall 17a of the case 17. Further, the guide plate 64 is notched at its front end over a distance which covers the platen 3 and friction member 15.

In the above configuration, while the loading plate 19 is raised, the front end portion of the guide plate 64 lightly presses itself against the upper surface of the plate 19 or the sheet stack on the plate 19 by gravity. However, because the front end portion of the guide plate 64 is notched as stated above, an end portion of the top of the sheet stack is directly pressed against the platen 3. In this condition, the sheet 11 fed out is separated from the others by the friction member 15 as in the previous embodiment. When the presser lever 52 is operated to lower the loading plate 19, the front end of the guide plate 64 is supported by the upper edge of the front wall 17a of the case 17, as shown in Fig. 13. In the condition shown in Fig. 13, a narrow clearance is defined between the upper surface of the guide plate 64 and the periphery of the platen 3 while, at the same time, the friction member 15 is spaced from the platen 3, whereby a manual feed path 65 is defined. A sheet end regulating member 67 is rotatably supported in a front lower portion of the front wall 17a of the case 17 in such a manner as to be movable into and out of the manual feed path 65. This member 67 functions to position the leading end of a sheet which is manually inserted in the manual feed path 65 along the upper surface of the guide plate 64 through a manual feed opening 66, Fig. 12, which is defined by the guide plate 64 and the sheet feed opening of the printer body 2. As shown in Fig. 13, when the loading plate 19 is lowered, it in turn lowers the tip of a horizontal arm of the sheet end regulating member 67 to move the member 67 to an operative position as indicated by a solid line. In the operative position, the tip of a vertical arm of the regulating member 67 is protruded into the manual feed path 65. Conversely, when the loading plate 19 is raised, the regulating member 67 is rotated counterclockwise by gravity to an inoperative position in which, as indicated by a dash-and-dots line, the tip of the vertical arm is retracted from the manual feed path 65.

The mechanism for causing the friction member 15 into and out of contact with the platen 3 is as follows. Fig. 14 shows the sheet cassette 12 as seen from the left of Fig. 13. As shown, a member 68 is rigidly connected to the front end 17a of the cassette case 17. A lever 70 for applying a separating pressure is rotatably supported by a shaft 69 which is studded on the stationary member 68. The friction member 15 is mounted on the upper surface of a support 72 which is pivotally connected to one end of the lever 70 by a pin 71. In this manner, the friction member 15 is supported by the sheet cassette 12. A spring 73 for applying a separating pressure is anchored at one end to a projection which extends upward from the other end of the lever 70 and at the other end to a projection which extends downward from the stationary member 68. Hence, a sheet separating pressure is developed between the friction member 15 and the platen 3. The lower end of the support 72 is bent at

a right angel to form an engaging portion 72a. As shown in Fig. 15, a plate 75 adapted to cancel the separating pressure is pivotally supported at its rear end by the bottom plate of the feed tray. A lug 74 extends from the plate 75 throughout an opening which is formed through the bottom plate of the feed tray, the loading plate 19 pushing the lug 74 downward when lowered. The front end of the plate 75 is engaged with the upper surface of the engaging portion 72a of the support 72. In this construction, while the loading plate 19 is lowered as indicated by a dash-and-dots line in Fig. 15, the support 72 is lowered by the plate 75 against the action of the spring 73 so that the friction member 15 becomes spaced from the platen 3. As the loading plate 19 is raised, the support 72 is raised by the force of the spring 73 causing the friction member 15 into contact with the platen 3 by a predetermined separating pressure. Simultaneously, the plate 75 is moved to a position which is indicated by a solid line in Fig. 15.

To manually insert a sheet, the presser lever 52 is operated to lower the loading plate 19 to thereby provide a clearance between the guide plate 64 and the platen 3 and a clearance between the platen 3 and the friction member 15. These clearances define the manual feed path 65. Simultaneously, the tip of the sheet end regulating member 67 protrudes into the manual feed path 65. Then, a sheet is manually inserted into the manual feed path 65 through the opening 66 until the leading end of the sheet abuts against the regulating member 67.

Subsequently, the presser lever 52 is operated to raise the loading plate 19. At this instant, the loading plate 19 or the top of a sheet stack loaded thereon pushes the guide plate 64 upward to thereby press the leading end of the sheet, which is positioned on the guide plate 64, against the platen 3. Upon the rise of the loading plate 19, the friction member 15 is brought into pressing contact with the platen 3 through the leading end of the manually inserted sheet while, at the same time, the sheet end regulating member 67 is retracted. In this condition, when the platen 3 is rotated by a feed signal, the manually inserted sheet is fed by the platen 3 for printing data therein.

In the above embodiment, the movement of the friction member 15 into and out of contact with the platen 3 and that of the sheet end regulating member 67 into and out of the manual feed path 65 are interlocked with the application and cancellation of pressure which acts on the loading plate 19. Alternatively, an arrangement may be made such that, when manual insertion of a sheet is sensed, the friction member 15 is released from the platen 3 and the sheet end regulating member 67 is protruded into the manual feed path 65 and, the regulating member 67 is sensed, the friction member 15 is moved into contact with the platen 3 and the regulating member 67 is retracted.

The rest of the construction of the embodiment shown in Figs. 12 to 15 is the same the previous embodiment. In this embodiment, too, the friction member 15 is mounted on the sheet cassette 12 which is in turn detachably mounted on the printer body 2. This offers the same various effects as those attainable with the previous embodiment.

In the embodiment shown in Fig. 12, the case 17 and loading plate 19 of the sheet cassette 12 are molded integrally with each other by using synthetic resin or like material. That part of such a molding where the case 17 and plate 19 join each other, i.e., the hinged portion 54 is made thinner than the rest to serve as a thinned or integral hinge. The loading plate 19 is rotatable about this hinge in the previously stated manner. Such an integral molding of loading plate 19 and case 17 cuts down the number of structural elements as well as production cost.

Referring to Figs. 16 and 17, still another embodiment of the present invention is shown. As shown in the figures, the case 17 and loading plate 19 of the sheet cassette 12 are molded integrally with each other, and the plate 19 is elastically deformable about the hinged portion 54 as indicated by an arrow I. As shown in Fig. 17, when the sheets 11 are stacked on the case 17, the loading plate 19 is deformed by the weight of the sheets in such a manner as to rotate about the hinged portion 54. Nevertheless, the sheets 11 are urged upward as viewed in Fig. 17 by the elasticity of the loading plate 19. Hence, as the sheet cassette 12 is loaded in the printer body 2, the sheet stack 11 is pressed against the platen 3 by the elasticity of the loading plate 19 to establish a predetermined feed pressure. Stated another way, the free end side of the loading plate 19 is projected as shown in Fig. 16, so that the predetermined feed pressure may be exerted. The structure shown in Figs. 16 an 17 eliminates the need for a spring otherwise installed for biasing the loading plate 19, contributing a great deal to the cut-down of cost.

As regards the material of the case 17 and loading plate 19 which are integral with each other as shown in Fig. 12 or 16, use may be made of ABS resin, vinyl chloride, polypropylene or like synthetic resin, or stainless steel, phosphor bronze or like metal. Nevertheless, the case 17 and loading plate 19 shown in Fig. 12 should preferably be made of synthetic resin to make the hinged portion 54 easy to bend.

While various embodiments of the present invention have been shown and described, it will be apparent that such different structures

charge tray may be provided on the top of the printer body 2 or on the cover of the sheet cassette 12 so as to stack sheets coming out of the printer body 2 on the discharge tray.

Needless to say, the platen 3 may be rotated in the opposite direction (counterclockwise as seen in Fig. 2) with the sheet cassette 12 mounted on the printer body 2, so as to feed the paper in the opposite direction. It will also be apparent that the present invention is applicable not only to a printer of the type using a type wheel as shown and described but also to other various kinds of printers such as a wire dot printer, thermal printer, and ink jet printer. Especially, the present invention is readily applicable to a thermal printer, ink jet printer and other non-impact type printers since, in this type of printers, a platen usually has a soft surface which exerts a substantial frictional force on a sheet and, hence, it is easily usable for separating and transporting a sheet.

In summary, it will be seen that in accordance with the present invention a platen of a printer serves to separate and transport a sheet and, therefore, eliminates the need for an independent feed roller heretofore installed to cooperate with a friction member. This simplifies the structure and, thereby, cuts down the cost of an automatic sheet feeder. Because a sheet cassette is detachable from the printer, a form tractor or like sheet feeder may be mounted in place of the sheet cassette. Further, only those users who need automatic sheet feed may purchase the automatic sheet feeder of the present invention. This, coupled with the fact that a friction member is mounted on the sheet cassette, reduces the cost of a printer body and, thereby, frees the users who do not need a sheet cassette from needless expenses. The friction member is easy to maintain. In addition, because the overall length of a sheet feed path of the automatic sheet feeder of the present invention is shorter than that of a prior art automatic sheet feeder, the sheet feed time is shortened and, yet, a minimum of sheet jam is allowed to occur. Even if a sheet jams the sheet feed path, it can be removed with ease.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof.

CLAIMS

1. In an automatic sheet feeder for a printer which includes a platen for separating and feeding sheets one by one from a sheet cassette which is detachably mounted on a printer body, said sheet cassette is provided with a friction member which makes pressing contact with said platen, the sheet moving through between said friction member and said platen when said sheet cassette is mounted on said printer body.

2. An automatic sheet feeder for a printer for separating and feeding sheets one by one from a sheet cassette which is detachably mounted on a printer body, comprising:

a support means constructed integrally with said sheet cassette for supporting and positioning said sheet cassette when said sheet cassette is mounted on said printer body;

a friction member movable into and out of contact with periphery of said platen;

a holder member for holding said friction member; and

an urging means for urging said holder means to press said friction member against the periphery of said platen;

said friction member, holder member and urging member and said platen cooperating to constitute a sheet separating and transporting means.

3. An automatic sheet feeder as claimed in claim 2, wherein said holder member is supported by said support means in such a manner as to be movable toward said platen.

4. An automatic sheet feeder as claimed in claim 3, wherein said urging means comprises a coiled compression spring.

5. An automatic sheet feeder as claimed in claim 2, wherein said urging means comprises a leaf spring which is mounted on said sheet cassette.

6. An automatic sheet feeder as claimed in claim 2, wherein said urging means comprises a part of said sheet cassette which has elasticity.

7. An automatic sheet feeder as claimed in claim 2, wherein said holder member is rotatably supported by said support means.

8. An automatic sheet feeder as claimed in claim 7, further comprising a lever which is rotatably supported by said holder member.

9. An automatic sheet feeder as claimed in claim 1, further comprising a stop means for obstructing transport of the sheet.

10. An automatic sheet feeder as claimed in claim 9, wherein said stop means comprises a sheet sensing means disposed in a sheet transport path, at least one rotatable stop one end of which is engageable with said platen, and a drive means for driving said stop in a rotational motion through the other end of said stop.

11. An automatic sheet feeder as claimed in claim 10, wherein said sheet sensing means comprises a photosensor.

12. An automatic sheet feeder as claimed in claim 10, wherein said drive means comprises a solenoid.

13. An automatic sheet feeder as claimed in claim 1, wherein said friction member comprises a block of formed polyurethane.

14. An automatic sheet feeder as claimed in claim 1, wherein assuming that a frictional force acting between said platen and the sheet is μ_1, a frictional force acting between

the sheet and said friction member is μ_2, and a frictional force acting between the sheets is μ_3, there holds a relation $\mu_1 > \mu_2 > \mu_3$.

15. An automatic sheet feeder substantially as herein described with reference to the accompanying drawings.

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